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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/084,962  
Filing Date: February 27, 2002  
Appellant(s): WOODRUFF ET AL.

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Keith V. Rockey  
Reg. No. 24,713  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 31 December 2007 appealing from the Office action mailed 11 December 2006.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is incorrect.

However, the Final Office Action is mailed 11 December 2006, not 4 June 2007 as stated by the appellant.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

US 5,670,034	Lowery	23 September 1997
US 3,880,725	Van Raalte et al.	29 April 1975
JP 59-150094	Inagaki	28 August 1984
JP 04-311591	Hirohiko	04 November 1992

**(8) Evidence Relied Upon**

No evidence is relied upon by the examiner in the rejection of the claims under appeal.

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 17 and 21-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Lowery US 5,670,034 (Lowery).

Lowery discloses an electroplating apparatus comprising an electrolytic tank (Fig. 1 numeral 12), semiconductor wafer (Fig. 5 numeral 116), wafer contact pins (Fig. 5 numeral 136, col. 7 lines 22-27), and two anodes (Fig. 3 numeral 72A and 72B, col. 5 lines 23-26). Lowery further teaches that the electroplating apparatus is used to plate metals such as copper onto the semiconductor substrate (col. 1 lines 11-13, col. 2 lines 29-37).

Regarding instant claim 17, the electrolytic tank of Lowery reads on the claimed chamber. The wafer contact pins of Lowery read on the claimed cathode contact. The two anodes of Lowery read on the primary and secondary anodes as claimed. The two anodes and the wafer contact pins are disposed within the electrolytic tank as claimed. Since the apparatus of Lowery is used to plate metals such as copper onto the semiconductor substrate, the claimed metallic solution carrying copper ions would have inherently disposed within the electrolytic tank in order for the electroplating to take place. The language "for providing a variable current to said semiconductor wafer" does not rendered the instant claim patentable since it is merely stating the intended use for

Art Unit: 1700

the secondary anode and does not provide any structural limitations that differentiate the instantly claimed apparatus from the apparatus of Lowery. In addition, it is the examiner's position that the power source as taught by Lowery is inherently capable of providing various current to the primary and secondary anodes as claimed since simply turning on and off the power source already provide different current to the primary and secondary anodes.

Regarding instant claim 21, Lowery teaches the semiconductor wafer being coupled to the contact pins (i.e. cathode contact) and acting as a cathode to receive electroplated metal film as claimed.

Regarding instant claim 22, Lowery teaches the second anode being inside the electrolytic tank (i.e. chamber) as claimed.

Claims 17, 21-22 and 24-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Van Raalte et al. US 3,880,725 (Van Raalte).

Van Raalte teaches an electroplating apparatus comprising a plurality of anodes (Fig. 2 numeral 116), a cathode in contact with a wafer (Fig. 2 numeral 112), a power source capable providing independently controlled current to each of the plurality of anodes (abstract, col. 3 line 55 – col. 4 line 35). Van Raalte further teaches a metallic solution for electroplating (col. 2 lines 29-32).

Regarding claims 17, 21-22 and 30-32, the electroplating apparatus of Van Raalte inherently contains the claimed plurality of leads and is inherently capable of providing different current levels to different anodes, including providing a higher current

at the inner portion of wafer and a lower current at the outer portion of the wafer as claimed.

Regarding claims 24-29, the claimed limitations relate to how the power source is operated, therefore, is construed as a process limitation, which does not lend patentability to the instant apparatus claimed. As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Claims 17-22 and 24-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Inagaki JP 59-150094 (Inagaki).

Inagaki teaches an electroplating apparatus comprising a cup-shaped plating reactor vessel for holding the metallic plating solution, a workpiece being positioned in transverse relationship to the center axis of the plating vessel, a plurality of concentrically arranged anodes perpendicular to the center axis of the plating vessel and separated by dielectric partition walls (Fig. 9, numerals 17, 13, 41-43, 45). Inagaki further teaches that the concentrically positioned anodes are independently connected to separate power sources (Fig. 9 numerals 38-40).

Regarding claims 17-22 and 30-32, the apparatus of Inagaki is inherently capable of providing various levels of voltage to different anodes as claimed. The claimed plurality of leads is inherently present in the apparatus of Inagaki in order to connect each of the anodes to separate power sources as taught by Inagaki. Inagaki

Art Unit: 1700

further teaches the claimed cathode contact electrically coupled to the wafer (Fig. 9, numeral 35).

Regarding claims 24-29, the claimed limitations relate to how the power source is operated, therefore, is construed as a process limitation, which does not lend patentability to the instant apparatus claimed. As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagaki.

The teachings of Inagaki are set forth above.

Even though Inagaki does not explicitly teach that the metallic plating solution is a copper solution, one of ordinary skill in the art would have found it obvious to use the apparatus of Inagaki in copper plating with expected success since nickel plating and copper plating uses the same electrochemical plating concept.

Claims 17-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirohiko JP 04-311591 (Hirohiko).

Hirohiko teaches an electroplating apparatus comprises a plurality of concentric anodes (Fig. 1 numeral 4) separated by dielectric walls (Figs. 1-2, numeral 121), a cathode (Fig.1 numeral 3). Hirohiko further teaches a metallic plating solution (page 17, [0027]) and a power source couple to the anodes and the cathode (pages 11-12,[0017-0019]).

Regarding claim 17, even though Hirohiko does not explicitly teach that the power source is capable of providing variable current to the claimed primary and secondary anodes, one of ordinary skill in the art would have found it obvious to implement a power source capable of providing variable current to the anodes in order to control the plating speed and uniformity.

Regarding claims 18-20 and 22, the multiple concentric anode rings as taught by Hirohiko read on the claimed primary and secondary anode rings in the electrochemical cell.

Regarding claim 21, the electroplating apparatus of Hirohiko teaches the claimed semiconductor wafer (Fig. 3 numeral 9) coupled to the cathode and receiving a electroplated film on its surfaces.

Regarding claim 23, even though Hirohiko does not explicitly teach the claimed copper plating solution, Hirohiko teaches that its electroplating apparatus can be used to plate any kind of single metal or alloy (page 19 [0029]). One of ordinary skill in the art would have found it obvious to have implement the electroplating apparatus of Hirohiko in plating copper with expected success since copper plating is widely used in semiconductor wafer processing technologies.

Regarding claims 24-29, the claimed limitations relate to how the power source is operated, therefore, is construed as a process limitation, which does not lend patentability to the instant apparatus claimed. As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art



apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Claims 30-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirohiko in view of Van Raalte.

The teachings of Hirohiko are set forth above. However, Hirohiko does not teach the claimed anodes being independently connected to the power source to provide variable current.

The teachings of Van Raalte are discussed as set forth above.

It would have been obvious to one of ordinary skill in the art to have incorporated the independently controlled power source to anode connections as taught by Van Raalte into the plurality of concentric anodes of Hirohiko in order to achieve more accurate and easy electrodeposition to form a metal film with desired thickness profile (col. 4 lines 7-11, 30-35).

Regarding claims 30-32, the electroplating apparatus of Hirohiko in view of Van Raalte inherently contains the claimed plurality of leads and is inherently capable of providing different current levels to different anodes, including providing a higher current at the inner portion of wafer and a lower current at the outer portion of the wafer as claimed.

Regarding claims 33-34, the concentrically positioned anodes as taught by Hirohiko in view of Van Raalte meets the limitations of the claimed anodes.

**(10) Response to Argument**

Appellant argues that Lowery does not anticipate the instant invention because the instant claims limits the structure of the secondary anode to be electrically independent from the primary anode and the primary and secondary anodes are separately connected and controlled.

The examiner does not find appellant's argument convincing since instant claim 17 does not require the primary and secondary anodes to be separately connected and controlled. The instant claim 17 only recites that "said power source capable of producing said variable current by providing varying levels of voltage to said primary anode and to said secondary anode". Therefore, a power source capable of providing variable current to commonly connected anodes as taught by Lowery also reads on the instant claim 17 since instant claim 17 does not exclude providing current to commonly connected anodes and varying the current to both anodes by the same amount due to its common electrical connection. Therefore, based on the broadest reasonable interpretation, the examiner maintains that the rejection based on Lowery reference is proper.

Appellant further argues that Van Raalte teaches plating of metal instead of claimed plating of a semiconductor wafer, therefore, is not capable of anticipating the instant invention. Appellant also asserts that the preamble to the claims, in calling for plating of semiconductor wafers, should be given weight in defining the invention.

The examiner does not find appellant's argument persuasive since the instant claims are directed to an apparatus. The electroplating of a semiconductor wafer as

Art Unit: 1700

recited in the preamble of the instant claim 17 merely describes the intended use for the instant apparatus and does not provide specific structural limitations that differentiate the instantly claimed apparatus from the electroplating apparatus of Van Raalte. Therefore, the recited intended use language does not render the instantly claimed apparatus patentable. Furthermore, since Van Raalte teaches an apparatus that is structurally the same as the instantly claimed apparatus, the examiner concludes that the apparatus of Van Raalte is capable of plating a semiconductor wafer as claimed.

Appellant further argues that Inagaki "fails to teach the concept of various level of voltage to different anodes".

The examiner does not find appellant's argument convincing since Inagaki teaches that its concentrically arranged anodes are independently connected to different power sources. Inagaki even listed ratios of different power source (see page 15 middle section of the Official Translation). Therefore, the electroplating apparatus of Inagaki is capable of applying variable current to different anodes as claimed. In addition, the various levels of voltage as claimed is directed to how claimed apparatus is being operated (i.e. process limitation in apparatus claims). As stated in MPEP 2114 [R-1], it is well settled that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus as long as the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Appellant further argues that Hirohiko has the same deficiencies as Inagaki.

Art Unit: 1700

As stated above, the claimed provision of various levels of voltage to different anodes is directed to how claimed apparatus is being operated (i.e. process limitation in apparatus claims) and does not differentiate the instantly claimed apparatus from the apparatus of Hirohiko since Hirohiko teaches an electroplating apparatus that is structurally the same as the claimed apparatus as recited in independent claim 17. Furthermore, simply turning on and off the power source of Hirohiko would have produced different current/voltage variation based on the broadest reasonable interpretation.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Lois Zheng/

Examiner, Art Unit 1793

Conferees:

Roy King, SPE

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Art Unit: 1700

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